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BUREAU ARTIST RETIRES

Esther Hastings Hart, illustrator in the Bureau of Entomology, retired from the service on February 29 after 23 years' work in the Government. Miss Hart is a daughter of the late Dr. Ira Hart of Elmira, N. Y. She holds the degree of Bachelor of Arts from Elmira College, N. Y., and also took a four years' course in wood engraving at Cooper Institute, New York City, where she was associated with Mrs. Anna Botsford Comstock. Her first work in the Government was that of topographical draftsman in the U. S. Forest Service. She has served as artist in the Bureau of Entomology since 1911. She is a member of the Biological Society of Washington, the American Association of University Women, and the Washington Art and Archaeological Society. Her associates in the Division of Cereal and Forage Insects gave her a luncheon on February 20 at the Shoreham Hotel, and on February 25 a purse of gold was presented to her by about 140 of her colleagues and friends throughout the Bureau in Washington and in the field.

INSECTS AFFECTING MAN AND ANIMALS

"The mild temperatures and dry weather continued during the month" (January), according to a report from W. E. Dove, who says, "On the warmer days adult sand-flies were numerous on both dogs and pigs at Savannah and Charleston (S. C.). The dry weather is favoring accumulations of sand-fly larvae in low places of drainage ditches at Charleston."

In treatments for sand-fly larvae, "A fair degree of control was obtained at Jacksonville, Fla., by John B. Hull in a test on burning a breeding area," states Mr. Dove. "The area was saturated with distillate oil and then burned. Before treatment there was an average of approximately 50 larvae to the quart. After treatment there was an average of approximately 3 to the quart. * * * At Charleston, S. C., a small marsh traversed by a road gave an average of approximately 149 larvae per quart. After burning with distilate oil 5 quarts of the soil furnished only 7 larvae. Preliminary tests in the laboratory show that larvae subjected to a temperature of 50° C. for a period of 15 minutes are readily killed. We are of the opinion that burning for concentrations of larvae is a practical procedure. Further studies are to be made with such treatments."

W. G. Bruce, Fargo, N. Dak., reports that, "A gnat (Hippelates sp.) is reported as a most troublesome pest throughout central Florida from Orlando north. This pest does not bite or sting but great numbers fly about the face of man, getting into the eyes, ears, and nose. While out collecting birds one day (about January 28th) in the Ocala area, these gnats were so annoying that it was impossible to sight a gun. At Mt. Dora and Ocala eye trouble is reported among school children and this gnat is accused of being responsible for it."

O. G. Babcock, Sonora, Tex., reports as follows on the longevity of goat scab mites: "On January 2, 1932, a large mass of scab mites were removed from a scabby goat and placed in pill boxes. * * * The mites were placed in an incubator where the temperature was maintained at 88° to 90° F., and an average humidity of 66 per cent. * * * By the 14th day all the mites had died, except 39 which were alive and active. Nine more died after 2 days' time. By the 21st day, 7 mites were alive and active, but by the 28th day only 3 mites remained alive. Two remained alive on the 29th day, but one of these was barely active. One mite was still alive and active after 30 days, and no doubt will live a day or two longer. This shows that well-fed goat scab mites under ideal conditions may live apart from the host for at least a month; hence a pasture under quarantine to be clean must be kept free from scabby goats for a minimum period of 4 to 6 weeks."

R. A. Roberts, who is engaged in studies of overwintering of parasites and predators of blowflies at Uvalde, Tex., says: "The only blowfly parasite adults active during January were Brachymeria fonscolombei Duf. and Mormoniella vitripennis Wlk. One adult of B. fonscolombei emerged January 19; this is not unusual, for a few specimens of B. fonscolombei usually emerge during January, often as late as January 21. The pupal parasite was abundant throughout the month." In regard to predators, he states: "In the overwintering cages, Saprinus lugens Er. continues to be active in both adult and immature forms. Numerous adults have been alive and active since November. Eggs are being secured and all stages of larvae and pupae are present."

STORED PRODUCT INSECTS

Newell E. Good, Sligo, Md., in his biological studies of the confused flour beetle (Tribolium confusum Duv.) and the rusty-red flour beetle (T. ferrugineum Fab.), has found that "Adults of both species may live for two years or even longer. In T. confusum the oviposition period may last as long as 14 months, while the average is about 9 months. In T. ferrugineum it is slightly less. A female of either species usually lays 400 to 500 eggs during this time and in some cases nearly 1,000 eggs have been laid by a single female. The average incubation period at 27° C. is 6.8 days for T. confusum and 5.5 days for T. ferrugineum. The number of larval instars varies from 6 to 11, with an average of 7 or 8. The larval period at 27° C. varied from 27 to 90 days, according to the food used. It is slightly longer for T. confusum than for T. ferrugineum. Whole wheat flour, middlings, bran, corn-meal, oatmeal, and white flour were the foods used in the order of their acceptability."

George W. Ellington, Sligo, reports that "Further tests, with para-dichlorobenzene at different temperatures, were conducted during the month against certain species of insects attacking stored seeds. At a temperature of 80° F. (rice weevil) Sitophilus oryzae L. adults were killed in 8 hours, whereas 17 hours is required to kill this insect at a temperature of 60° F. The same fumigant at the above temperatures gave similar results against other stored seed insects."

S. E. McClendon, Thomasville, Ga., reports that "insects in stored grains have been active all winter, there being no cold weather to check them. Last November 100 ears of corn were collected in Glynn County, each ear was wrapped separately in paper, and the weevils counted in January with the following results: Eighteen ears were free of rice weevils; 82 ears had 3,608 rice weevils, or an average of 44 to the ear; 66 ears had broad-nosed grain weevils." The numbers of rice weevils to the ear ranged from 5 to 112. Under conditions as favorable as those of the past winter considerable rice weevil activity in corn on Southern farms might be expected.

E. M. Livingstone, of the cured tobacco insect investigations, Richmond, Va., has under observation about 600 larvae of the tobacco moth (Ephestia elutella Hbn.), according to W. D. Reed, who says: "The climate has been so mild that these larvae had not gone into hibernation on January 31. They have fed on the tobacco some during warm days, and remained sluggish in their feeding tunnels during cool weather. The last emergence in the laboratory took place on November 23. * * * Due to the unusually warm weather throughout January some activity of this insect continued throughout the month. The superintendent of the infested warehouses in Richmond reported that they observed living moths occasionally until January 31. A. W. Morrill, jr., and I collected a living moth from one of the warehouses on January 6. On January 26 we examined eight hogsheads (8,000 pounds) of flue-cured tobacco from one of the infested warehouses. A number of living larvae were collected, all in active condition. They averaged 8.1 mm. in length, being about two-thirds grown."

Mr. Reed states also that "On January 15 we received a sample of flue-cured tobacco from a firm in Greenville, N. C. In a 1-pound sample of this tobacco Mr. Morrill found 100 grown larvae and 35 adults of the tobacco beetle (Lasioderma serricorne Fab.). All of these insects were active and apparently had not been in hibernation. This sample was collected from the surface of a hogshead in Greenville on January 14. Examinations of hogsheads of flue-cured tobacco in the Richmond district during January did not reveal any active infestation."

The work of examining bean samples from warehouses at Modesto, Calif., "has been finished for the season," writes C. K. Fisher. A table which gives "the infestation of all the samples of all varieties of the 1931 crop" is submitted by Mr. Fisher, who says: "From the table it will be seen that the total number of samples examined was 3,532 and that 2,286

showed infestation, giving a percentage of 64.72 of all the samples infested. The degree of infestation (not shown in the table) ranged from very light to very heavy, the majority being medium. At the end of the examination of the 1930 crop an infestation of 30.23 per cent of all varieties was found."

From Perez Simmons, Fresno, Calif., we have this interesting comment on bait trapping of dried-fruit insects: "In view of the more than 9,000 beneficial parasites (Microbracon and Nemeritis) destroyed during the trapping of about 40,000 injurious moths (of which about 20,000 were females) there is some question as to the value of the traps for purposes other than census-taking. (The parasites listed are not known to affect the larvae or adults of Carpophilus spp.)."

Tom Brindley, Moscow, Idaho, continuing in January his weekly studies on the mortality of the pea weevil, reports: "Practically no mortality was observed among the weevils remaining in the peas in a warehouse, while a loss of 34 per cent has been found among the weevils free in the peas. A large part of this mortality may be due to injuries received by the weevils when they were moved about, rather than to climatic factors. The maximum mortality found among weevils hibernating in coniferous trees was 10 per cent, while a maximum of 40 per cent was found among weevils hibernating in fence posts. Woodpeckers (downy and hairy) have reduced considerably the population of weevils hibernating in fence posts. * * * In a survey of the number of weevils hibernating in the fence posts about a badly infested field 130 posts have been examined and 4,376 weevils found, or an average of 37 weevils per post."

TOXICOLOGY AND PHYSIOLOGY OF INSECTS

M. C. Swingle, Takoma, Md., reports that "Proteins and carbohydrates seem to be more important than fats in the diet of cockroaches. * * * Certain carbohydrates were very good. Other carbohydrates, like most of the fats tested, were little better than a diet of water alone. * * * One might conclude * * * that most of the materials eaten by insects are of practically no food value to them. Many leaf-feeding insects do not digest starch or cellulose, although these materials are well represented in their diet. * * * the food habits of any insect is probably linked up with a relatively small number of organic compounds." He says of cockroaches: "In a humid atmosphere these insects can live for about a month without food or water, but if placed in an ordinary atmosphere where evaporation can take place, they will not live longer than a week or ten days. This shows that simple environmental factors, such as humidity, may be even more important than food in rearing insects for experimental work."

D. E. Fink, Takoma Park, who reported in December on his study of the metabolic activity of hibernating larvae of the codling moth (Carpocapsa pomonella L.) and the strawberry leaf roller (Ancylis comptana Froel.), submits a summary of results obtained in January. He says

that the total loss in weight of C. pomonella was 3 per cent; of their water content they lost 1 per cent; glucose, 33 per cent; glycogen, 10 per cent; fat, 15 per cent; insoluble nitrogen, 0.3 per cent; insoluble protein, 0.65 per cent; soluble nitrogen, 0.05 per cent; and soluble protein, 0.14 per cent. For A. comptana, on the other hand, the total loss of weight was 15 per cent; the loss of water, 2 per cent; glucose, 8 per cent; glycogen, 26 per cent; insoluble nitrogen, 0.05 per cent; insoluble protein, 0.25 per cent; and soluble protein, 0.01 per cent. They lost no soluble nitrogen and they gained 0.5 per cent fat.

J. W. Bulger, Takoma Park, reports that with the assistnce of Abby Holdridge, he has "calculated a table which shows that 15 tubular cutters ranging in size from .14 to .28 inch in diameter, inclusive, will vary the size of sandwich sufficiently to enable us to feed silkworms ranging in weight from .30 to .39 gram, respectively, doses of poison which will, according to calculations, approximate as closely as possible any given median lethal dose. This will enable us much more rapidly and accurately to establish any given point on the toxicity curve for a given poison or substance. This method should prove to be a substantial improvement over our present sandwich method."

Reporting further on the studies by himself and W. N. Sullivan on the toxicity of rotenone to house flies, F. L. Campbell, Takoma Park, states that there is no appreciable difference in the susceptibility of the sexes to rotenone in acetone at 1-to-5,000. Tests were made also to compare the results of treatments in the cold room with those at room temperature. It was found that "an average of 80 per cent of the flies treated with rotenone 1-to-5,000 in acetone died in 48 hours. Since the same solution kills only about 40 per cent of the flies that are treated in the cold room, it must be concluded that the treatment is more effective at room temperature." Dr. Campbell also states that in his rearing work, "The dying out of the maggots * * * has been prevented by reducing by one-third the quantity of water in the medium. Puparia are now formed below the surface of the medium, and the mature maggots no longer crawl to the top of the jars. It is worth noting that the temperature of the medium at the bottom may rise to 117° F. during the initial fermentation without injury to the maggots. Egg production continues to be satisfactory, although the flies have not been exposed to sunlight for three months."

Since the controversy about the location of the olfactory organs in insects still remains unsettled, N. E. McIndoo, Takoma Park, tested blowflies, Calliphora erythrocephala Meig. and Phormia regina Meig., in his wooden olfactometer and found no difference between the olfactory responses of unmutilated flies and flies with their antennae pulled off. Each set of flies consisted of about 200 insects and in regard to their behavior and mortality there was not a great difference between the unmutilated and the mutilated flies.

BEE CULTURE

Warren Whitcomb, who is engaged in wax moth studies at Baton Rouge, La., states: "Preliminary tests show that sodium fluosilicate incorporated into beeswax in the proportion of 1-to-50 is not effective on larvae of the wax moth, Galleria mellonella L., except after long periods. Potassium fluoaluminate in the same proportion kills quickly."

Everett Oertel and John D. Mizelle report on egg tubule studies at Baton Rouge: "Ovaries from queens whose body measurements are known are dissected and sectioned, and the number of egg tubules is determined." He finds "that there is a significant difference in the number of egg tubules in different lots of queen bees obtained from queen breeders. There is also a significant difference between different lots of virgin queens. The virgin queens are from different breeding queens. This indicates that by selection and controlled mating the number of egg tubules in the queen bees' ovaries may be increased."

FRUIT AND SHADE TREE INSECTS

Correction: The control experiments against the hickory shuckworm reported on page 5 of the December Monthly Letter should be credited to H. S. Adair.

Howard Baker, Shreveport, La., reports that in carrying out experiments aiming at the control of the obscure scale (Chrysomphalus obscurus Comst.) on pecan, examination of samples "indicates that the percentage of dead is fairly uniform on the older wood attacked, no matter what the intensity of the infestation. * * * it is believed that counts made to determine the effectiveness of any spray in controlling this scale should be confined for the most part to wood over three years old. * * * It was noted that the females far outnumber the males on all ages of wood but that the ratio decreases on the younger, newer wood. It was noted also that most of the females on the older wood develop under old scale covers and, inasmuch as the major portion of obscure-scale infestation is on the older wood, this is the figure in which we are most interested from a control standpoint. It was further noted that only a very small proportion of the males seek the protection of old scale covers for development, but that on wood of any age they tend to develop on the open side unprotected by the old covers. * * * It was noted * * * that the percentage of dead is considerably less for that portion of the scale population settling under old scale covers, as compared to the portion settling outside," and "that the percentage of dead is practically the same, no matter which side of the tree the samples were taken from."

E. H. Siegler, Takoma Park, Md., reports that, "A few larvae of the lesser chestnut weevil (Curculio auriger Casey) issued during January from the chestnuts obtained from our experimental spray plants located at Fairfax, Va. Owing to the great abundance of the pest in

the experimental orchard, the larvae have not completed their development within the normal period. This constitutes a case of semistarvation, due to the females depositing more eggs than the food supply present in the nut would justify. In other words, the quantity of food is insufficient to permit the full development of the larvae. Apparently no cannibalism exists."

E. J. Newcomer, Yakima, Wash., reports that he and his assistants "have been studying the distribution on the tree of blemishes caused on apples by the codling moth, and have found some rather interesting things. The data used were taken from 10 trees in 1928 that were arbitrarily divided vertically into four quarters, each of which was divided horizontally into two parts. We thus have records of the fruit from 8 sections of each tree. We find a very high correlation between number of fruits and number of blemishes, the coefficient being .754 $\pm$ .046. * * * There is also a definite correlation between number of blemishes per fruit and height, the number being larger in the upper half of the tree. The coefficient figured .499 $\pm$ .057. * * * This study indicates that use of actual numbers of wormy or blemished fruits for comparative purposes is apt to be misleading. If less than whole trees are used, the portions should be vertical sectors of about the same size and taken from the same side of each tree. This procedure should eliminate most of the variation caused by variation in crop, but it will not eliminate variation caused by field heterogeneity."

The data taken by J. L. Gardiner in the oriental fruit moth trap work at Harriman, Tenn., were tabulated in January and a report submitted by H. G. Butler, which concludes. "During the winter of 1930-31 a large number of peach mummies were * * * examined for oriental fruit moth larvae. It was found that an average of one larva could be found for each peach mummy. This winter similar examinations have been made * * * and it has been found that larvae are practically absent from peach mummies. It is thought that possibly the long-continued warm weather last fall permitted the immature larvae to complete their feeding and move to better hibernation quarters."

L. F. Steiner, Cornelia, Ga., has been analyzing data and preparing a map of the 1931 large-scale bait trap area, and reports: "The oriental fruit moths at time of capture were most numerous near the boundaries of the area. The maps show clearly that experimental baits when compared in field tests must be represented by a large number of traps uniformly distributed among each other if errors due to variations in the intensity of the moth population are to be minimized. * * * Fruit and twig injury within the area was distributed more uniformly than the moth captures. Indications are that only a small percentage of the moths are captured in traps nearest their place of emergence. With continued baiting over a period of years it appears likely that a difference in the intensity of the infestation inside as compared with that along the boundaries of the area will develop and gradually increase."

Reporting on parasites of the oriental fruit moth, W. P. Yetter, Vincennes, Ind., says: "All parasites emerging from infested peach twigs brought into the laboratory were saved for identification purposes. A total of 561 parasites were saved. All of these were sent to H. W. Allen of the Bureau of Entomology at Moorestown ,N. J., for identification. Dr. Allen reports that 373, or 66.4 per cent, were Macrocentrus ancylivora Rch. and that 167, or 29.7 per cent, were Macrocentrus delicatus Cress. Twenty-one parasites, or 3.7 per cent, were retained by Dr. Allen for further study. Of these 21, 7 appeared to be species of Macrocentrus, 10 of Cremastus, and 4 probably were M. ancylivora. Dr. Allen stated that the species of Macrocentrus may include two or three separate species, at least one of which is new to science, and the description of which will appear in Muesebeck's revision soon to be printed."

JAPANESE BEETLE AND ASIATIC BEETLE RESEARCH

R. W. Burrell, reporting progress in his search for parasites of scarabaeid beetles at Homebush, Australia, says: "The entire month of December was spent at Woy Woy with an assistant, collecting and breeding for shipment the two species of Palpostoma which occur locally. Two methods of obtaining the puparia were tried. The first was collecting the beetles Anoplognathus olivieri Dalm. in the field and keeping them in cages to obtain puparia from the beetles parasitized naturally in the field. The second method tried was exposing the beetles in cages to flies obtained from the field at night with a strong lantern and a net. This second method was apparently successful when tried on a very limited scale last season, but was not successful when tried on a large scale this year. Consequently reliance had to be placed solely on field parasitism. Beetles were obtained by climbing large eucalyptus trees and shaking the branches. During the month some 6,000 beetles and 3,500 puparia of Palpostoma were obtained."

Mr. Burrell says that "The results obtained from attempts to rear larvae of Ithone fusca Newm. have been very disappointing so far," and that "the results obtained in the laboratory from the species of Thynnoides mentioned in the November report are complete, though hardly satisfactory. In all, seven eggs were deposited. It seems significant that no female laid more than one egg. * * * All eggs were deposited ventrally on the third and fifth abdominal segments, and on or near the median line, long axis parallel to the long axis of the host, anterior end directed cephalad. As noted before, the host, once stung, never recovers the power of locomotion. The seven eggs were deposited on six different species of grubs. One was a large rutelid grub, Anoplognathus sp. The other six were melolonthine. Two were on Sericesthis pruinosa Dalm. Another was on Phyllotocus macleayi Fischer. One was on Aphodius sp. The other two were on grubs the adults of which were not reared out. All of the eggs hatched and got to be half grown or more before the parasite larva died. Only one came through to a cocoon."

T. R. Gardiner, engaged in receiving, rearing, and distributing imported parasites, reports that as a result of extensive scouting for adult flies of Dexia ventralis Ald. throughout the season at the Andorra, Huntingdon Valley, colonies in Pennsylvania and the Haddonfield colony in New Jersey, "apparently there has been a gradual spread, as adults were found nearly a quarter of a mile farther than previous records show. Grub diggings made at Haddonfield throughout the season showed that practically all grubs were in suitable stages during the period of adult Dexia presence for the first and third generations. However, the number of suitable grubs in the soil during the second generation of adults in the field the latter part of July and early August was very low. Apparently this is the main factor which accounts for the great decrease of flies in the third generation."

The year's work with the parasite Tiphia asericae Allen and Jaynes is summarized by J. W. Balock, Moorestown, as follows: "One shipment of 28,471 cocoons was received during 1931. The emergence from the shipment received in 1930 totalled 6,154 (54.6 per cent) of which 58.9 per cent were males and 41 per cent females. Three colonies were liberated from this material. The colony liberated at Andorra Nurseries was scouted but no recovery was made; 684 Autoserica castanea Arrow grubs were parasitized by mated females resulting in a cocoon formation of 35.2 per cent; 576 grubs parasitized by unmated females resulted in a 30.2 per cent cocoon formation. An experiment run to determine the attraction of Autoserica castanea grubs to T. asericae seemed to indicate that T. asericae is not directly attracted to its host, but that locating the grub for parasitism by females is more a case of chance than of direct attraction."

Reporting on the lateral migration of grubs of Popillia japonica Newm. in soil, I. M. Hawley, Moorestown, says: "A test was started on December 14 to determine whether the presence of growing food would have an influence on the lateral migration of grubs under greenhouse conditions. Two bins, each 4 feet square, were filled with dirt to a depth of at least 1 foot. In one bin no food was supplied, while in the other wheat was planted. After a good root system had developed, 100 grubs were placed at a depth of 3 to 5 inches in a trench through the middle of each bin. The soil in the bins was kept moist and its temperature was normally between 65° F. and 75° F. Three weeks after the experiment started, the soil was removed and the position of each grub recorded. It was found that the lateral migration was essentially the same in the two bins, but that there was quite a marked difference in the depth of the grubs in the two cases. When the roots of wheat were available as food, 73 of 85 grubs recovered were in the top 7 inches of soil, while only 57 of 92 recovered were above the 7-inch level, where no food was present. In the series without food 72 of 92 recovered grubs had moved more than 8 inches, 42 more than 16 inches, and 17 more than 22 inches. With food present 62 of 85 recovered grubs had moved more than 8 inches, 37 more than 16 inches, and 14 more than 22 inches." Mr. Hawley also describes experiments in which the groubs migrated, within the confines of the bin, a distance of more than 4 feet, and indicates that he pro-

poses to continue these investigations in an experiment that will permit migration as far as 7 feet.

W. E. Fleming and F. E. Baker, Moorestown, in a study of the change in toxicity of different stomach poisons to the larvae of the Japanese beetle, report: "The insecticidal value of the different arsenates and fluosilicates has been determined immediately after application and 6, 12, and 18 months after the chemicals were mixed with soil. The data show that the fluosilicates lose their value as soil insecticides within a year, but the arsenicals did not change appreciably in their insecticidal value during a period of 18 months. The basic lead arsenate, which was initially low in insecticidal value, did not increase in toxicity and the acid lead arsenate, which was initially of high toxic value, decreased only slightly in toxicity."

Mr. Fleming conducted an experiment "with high voltage, 2,200 to 3,800 volts, as a means of destroying larvae in potted plants. It was found that these treatments were ineffective, except where prolonged until the soil was heated to a high temperature."

J. W. Lipp, Moorestown, reports that "the injection of emulsified carbon disulphide into the soil of potted plants continues to give satisfactory results in the control of the larvae of the Japanese beetle in potted plants. In this work 700 potted plants containing 9,000 larvae have been treated. A concentration of 3 parts of emulsified carbon disulphide in 1,000 parts of water appears to be the minimum quantity effective against the larvae. The indications are that Azalea indica will not withstand the treatment but, in view of the reaction of roses and other azaleas, it is expected that the treatment might be applied to several varieties without causing serious damage to the plants."

H. C. Hallock, Westbury, N. Y., reports the completion of "the compilation of the leaf-area of leaves taken from the spray experiments last summer and the chemical analysis to determine the amount of arsenic per square millimeter. * * * These tests show that the quantity of lead arsenate per square millimeter of leaf area was approximately double when the spray was applied personally than when applied by one of my assistants. The application of 3 pounds of lead arsenate (powder) to 50 gallons of water gave approximately double the milligrams of lead arsenate per square millimeter of leaf surface as compared with 4 pounds of coated lead arsenate (paste)."

Mr. Hallock says that "Field diggings on January 27 in which 303 grubs (of the Asiatic beetle, Anomala orientalis Waterh.) were counted showed the grubs to be distributed at the following depths: One inch, none; 2 inches, 2 per cent; 3 inches, 5 per cent; 4 inches, 12 per cent; 5 inches, 20 per cent; 6 inches, 26 per cent; 7 inches, 23 per cent; 8 inches, 6 per cent; 9 inches, 3 per cent; 10 inches 3 per cent." Similar diggings for the Asiatic garden beetle (Autoserica castanea Arrow) "show a slight grub movement but not as noticeable as in the case of Anomala orientalis. * * * the 205 grubs counted were found distributed

at the following depths: One inch, none; 2 inches, none; 3 inches, none; 4 inches, 2 per cent; 5 inches, 2 per cent; 6 inches, 4 per cent; 7 inches, 9 per cent; 8 inches, 9 per cent; 9 inches, 10 per cent; 10 inches, 16 per cent; 11 inches, 19 per cent; and 12 inches, 29 per cent."

TRUCK CROP AND GARDEN INSECTS

C. A. Weigel, with Floyd F. Smith and Henry H. Richardson, from the greenhouse for the study of insects affecting ornamentals, Washington, D. C., recently completed an investigation of the life history of the gladiolus thrips (Taeniothrips gladioli M. & S.) and the development of effective control measures for this pest. They summarize the results of their study as follows: "The habits of the insect seem to be remarkably adapted to the culture of the gladiolus, because it attacks the plant throughout the year. It feeds on all parts of the plant above the ground in the field, goes into storage with the corms, where it causes injury during the winter, and returns to the field with the corms at planting time. The cormels appear to be free from attack because of their protective covering." The report covers the habits, biology, and several effective means of control which have been carried out.

F. S. Blanton, Babylon, N. Y., submits a census of the lesser bulb flies (Eumerus) over the years 1929, 1930, and 1931. He says: "E. tuberculatus Rond. predominates with 94.5 per cent, 95.2 per cent, and 98.2 per cent, respectively. E. strigatus Fall. for the same years was represented with 5.5 per cent, 4.8 per cent, and 1.7 per cent. Specimens collected from heaps of discarded bulbs (dumps) furnished 10.4 per cent strigatus, however, as against 89.6 per cent tuberculatus. This tends to show that E. strigatus seems more of a scavenger than E. tuberculatus. Early in 1931 one male and one female of E. narcissi were collected in a greenhouse."

Randall Latta, Sumner, Wash., continuing his studies of vapor heat treatment, reports as to the effect of these treatments on the forcing qualities of narcissus bulbs that "the vapor heat-treated bulbs are giving pleasing results. Of the lots in bloom the treated bulbs appear equal to, if not better than, the checks, with one exception." He follows with details as to varieties.

C. F. Doucette and Mr. Latta have tested the effect of hydrocyanic acid fumigation on the forcing qualities of narcissus bulbs and report: "Lots of King Alfred bulbs were treated at weekly intervals from about August 1 to September 10 with the standard sodium cyanide dosage (7 ounces NaCN for 4 hours) * * * All the fumigated lots are blooming definitely ahead of the check and the flowers are of excellent commercial quality. Golden Spur fumigated for 18 hours in a dosage of 12 ounces NaCN per 100 cubic feet has grown and produced flowers, but the stems are shorter than the check, the flowers slightly smaller, and the period of bloom about a week later than the check. (This very

severe fumigation can be considered as slightly detrimental to the forcing quality.) However, Golden Spur fumigated for 16 hours in a dosage of 5 ounces NaCN per 100 cubic foot shows almost no difference as compared with the check in time of blooming, quality of bloom, or quantity."

In his study of the life history of the bulb mite (Rhizoglyphus hyacinthi Bdv.), R. H. Nelson, Sumner, Wash., finds, "At 70° F. and humidity 90, 100 per cent of the eggs hatch in 4 to 5 days, the larval stage lasts from 3 to 4 days, and the quiescent period between the larva and the protonymph is 1 day. Adults in incubator (70° F.) mate within 1 day after emergence; egg laying begins 1 to 2 days after emergence; and 1 mated female laid 99 eggs in 11 days. One pair kept at room temperature were still living in apparently good condition after 49 days, and eggs are still deposited at intervals, 1 or 2 at a time. Females apparently will not oviposit unless fertilized."

Ralph Scopp, Sumner, engaged in a study of the biology of Liothrips vaneeckei Priessner, reports that "Eggs kept in the incubator (at 70° F.) are hatching in 6 to 15 days. The peak appears to be about 10 to 11 days, although there are still eggs in this series which have not hatched. Eggs laid in November and December and kept at room temperature are not yet hatching (except 1 which hatched after 37 days). These eggs have been under observation from 72 to 81 days. These egg results indicate that fall-deposited eggs have hibernating qualities. One individual, emerged from pupa on December 20, began laying eggs January 3, and by the end of January had laid 30 eggs. Two of these have hatched. This indicates parthenogenesis. Pupal periods of three individuals were 14, 15, and 18 days."

K. B. McKinney, Tempe, Ariz., reports "the finding of adult (tobacco stalk) borers (Trichobaris mucorea Lec.) feeding on young Datura sprouts in protected places on January 20, although this winter has been the coldest on record since the winter of 1912 and 1913. An examination of a large quantity of Physalis stems that were killed by the first frost early in the fall shows that about two-thirds of the adults have left the cells but are still inside the stalks. On January 21 one live pupa was found in dry Physalis stems and on January 29 a live larva was taken from these dry stems."

Reporting on control of the pepper weevil (Anthonomus eugenii Cano), J. C. Elmore, Alhambra, Calif., says: "The pepper growers have shown a keen willingness in following our clean-up recommendations this winter. The larger per cent of the pepper fields were plowed as early as the rains would permit and in one locality the Japanese growers organized crews to go along roadsides and other waste places to destroy the nightshade. The Agricultural Commissioners are forcing land owners to clean up the few remaining pepper fields that are still standing. On January 19 it was reported that clean-up control could not be continued because it was necessary to find live pepper weevils on the old pepper plants,

which the inspectors were not able to do. We were asked to visit old pepper fields with the inspectors and demonstrate the presence of weevils and the method of finding them. We were able to show that adult weevils were present on small green shoots at the base of the old plants and that a large per cent of these old plants which appeared to be dead were actually green near the soil and were setting leaf and blossom buds during warm periods. The adult weevils feed on this green material and are able to multiply as soon as spring temperatures stimulate reproduction. Adults surviving on nightshade are likewise able to develop in nightshade berries early in the spring. From one to two and a half generations may develop as described above before new pepper fields are large enough to become infested."

J. R. Douglass, Estancia N. Mex., summarizes his notes on the emergence from hibernation of the Mexican bean beetle (Epilachna corrupta Muls.) as follows: "These experiments confirm the preceding seven years' findings which show that precipitation is the greater of the two known factors in stimulating emergence of the Mexican bean beetle from hibernation; that permanent emergence rarely occurs when the daily temperature is below 50° F.; rainfall is the starter and temperature is the accelerator in stimulating beetles to emerge. * * * The remarkable ability of the bean beetle to remain in hibernation during the hottest days is of great interest. Even more amazing and of more vital importance in practical application is the mechanical-like response of this insect to contact moisture."

W. A. Shands, engaged in investigations of sugar-beet insects at Grand Junction, Colo., reports "An experiment * * * to determine the protection afforded by snow cover. A soil thermograph was placed so as to make a continuous record of the soil-surface temperature beneath a 6 1/2 inch snow cover. Immediately on the surface of the snow was placed a hygro-thermograph to make a continuous record of the temperature on the surface of the snow. A record of a week's duration, in which the air temperature at 4 feet high went as low as 1 degree below zero F., showed that the minimum temperature at the snow surface went only as low as 4° F., while the minimum of soil surface beneath the snow went no lower than 20° F. The temperature of the soil surface beneath the snow cover ranged from 20° to 25° F., while the snow surface temperature varied from 4° to 37 1/2° F. These data seem to indicate that a snow cover even less than 6 1/2 inches in depth offers a tremendous amount of protection to the beet leafhopper (Eutettix tenellus Baker), as the insect is located at or just slightly above the soil surface during the winter."

In a study of the ability of beet leafhoppers to withstand low temperatures for various lengths of time, P. N. Annand and D. E. Fox, Twin Falls, Idaho, subjected "leafhoppers recovered from hibernation cages * * * to artificial drops in a cold box * * * The most interesting result of this work is a very definite indication that the in-

sects are able to withstand temperatures of between 5° and 10° F. for from 24 to 72 hours with very little mortality. A series which was run at between zero and 5 degrees below resulted in almost complete mortality. It is of interest to note that our soil-surface temperature, even under most severe winter conditions, does not normally reach 10° F., and never apparently goes below that point. It is also true that the short periods at which the lower temperatures are reached at the soil surface are of much shorter duration than those to which the insects were subjected under these artificial conditions. Although too early to draw any definite conclusions, the indications are that the actual temperatures to which the insects are subjected outside are not sufficient to account for the high mortality in years of low population."

C. F. Stahl and C. B. Wisecup, Sanford, Fla., state that, "The development of the celery leaf-tier (Phlyctaenia rubigalis Guen.) (in the field) has continued without interruption. * * * Moths were least abundant during the first 10 days, at which time counts averaged around 20 to 30 moths per 320-foot row." They report heavy emergence during the next two weeks, reaching during the end of the period upward of 1,000 per 320-foot row, conservatively estimated. "At the end of the month there were indications that the numbers were decreasing and that the decrease would be rapid."

FOREST INSECTS

M. T. Smulyan and R. C. Brown, of the gipsy moth laboratory, spent one day in New Hampshire visiting, according to Dr. Smulyan, "orchards in Dover, Greenland, Newington, and Kensington to ascertain present brown-tail moth conditions there and to observe the effects of the brown-tail moth fungus (Entomophthora aulicae Reich.). The fungus developed to epidemic proportions in these heavily-infested orchards last June and was responsible, as estimated by the writer at that time, for 50 to nearly 100 per cent mortality (varying with the orchards) of the brown-tail moth larvae and pupae. The infestation in all these orchards was found to be light, the overwintering webs averaging between one and two webs per tree."

J. M. Miller, Berkeley, Calif., writes that "During the month (January) a preliminary report reviewing the accomplishments of the 1931 regional survey (by himself, K. A. Salman, and P. C. Johnson) was completed and distributed to about sixty cooperators in the project. * * * The western pine beetle (Dendroctonus brevicomis Lec.) was found, as in the past, to be causing by far the greater part of the timber losses During the season two large areas of epidemic infestation developed where losses reached serious proportions. The Happy Camp-Lava Beds Area of 376,000 acres in the Modoc National Forest, which was included in the 1931 survey, had been covered by previous examinations by the Bureau of Entomology since 1931, so that there is now available an 11-year record of losses caused by insects. During this period the infestation

has passed through a distinct cycle, increasing from 1923 to 1927, and decreasing from 1928 to 1930. In 1931 it was again increasing, the losses being more than double those for 1930." Data submitted "emphasize not only the cycle of the infestation, but the varying intensity of the infestation in the different units."

"During the month (January) Ernest Wright, of the Office of Forest Pathology, spent considerable time at the Berkeley laboratory working with the (fir bark beetle) Scolytus ventralis Lec. material which we have in rearing," says J. M. Miller. "Mr. Wright has determined the fungus organism which is always associated with the attack of S. ventralis in the cambium of white fir as Trichoderma sp. He is at present carrying through a series of cultures from both larvae and adults of the insects to determine whether they act as carriers of the disease, either externally or through the alimentary canal. He is cooperating with G. R. Struble on this project."

"During the month (January) J. A. Beal completed a final report on the effect of a large logging operation in ponderosa pine timber on the population of the western pine beetle," says F. P. Keen, Portland, Oreg. "The results of this study showed that logging operations remove large numbers of the western pine beetle from the woods during the summer months. About 50 per cent of the logs show attack by this beetle after two weeks' exposure. While newly felled logs proved to be very attractive to the western pine beetle, the results of the study indicated that the attractive influence was more or less local and that beetles were not attracted from very great distances. Beetle infestation located about a mile from some of the cutting operations continued to increase during logging."

Reporting on cooperative control projects, Mr. Keen says of the mountain pine beetle (Dendroctonus monticolae Hopk.) that "the control of this beetle in the recreational areas of Crater Lake National Park has been very satisfactorily maintained through a system of annual maintenance work on these units and the treating of epidemic centers in the surrounding country. In spite of the menace of near-by infestation annual reductions in the infestation of fully 75 per cent have been consistently secured except in one year, when a heavy migration of beetles into a cleaned unit completely overshadowed the results of the work. * * * The present program contemplates reaching out into the surrounding areas and disposing of all concentrated centers, after which it is expected that a small amount of maintenance control will keep the forests in the protected areas reasonably free from infestation."

T. T. Terrell and J. C. Evenden, of the Coeur d'Alene, Idaho, project for control of the mountain pine beetle, state that "it is very evident from this work that a serious epidemic has been prevented, which would have resulted in a tremendous loss of valuable white pine. During these two seasons of control $176,366 has been spent for the treatment of 29,957 trees valued at $60,000. However, it is conservatively estimated that as a result of this operation some 160,545 trees valued at $321,090 have been saved, which shows a net gain in timber values of $144,724."

CEREAL AND FORAGE INSECTS

A. I. Balzer, Beaumont, Tex., states that the larvae of the sugarcane borer (Diatraea saccharalis Fab.) "were found actively feeding during January in late sorghums, which are still green, and in sugarcane shoots which have come up since the cane was harvested. In dry cornstalks examined, larvae were all in the overwintering stage."

A statistical compilation by R. L. Shotwell, Bozeman, Mont., of data on the life history and habits of the two-striped grasshopper (Melanoplus bivittatus Say), according to J. L. Parker, "has graphically shown some interesting things pertaining to the rôle temperature plays. The unusual hot temperatures experienced in South Dakota during July, last summer, forced the maximum feeding period up 1 1/2 hours earlier in the morning and shortened it by about 2 hours, as compared with the data obtained in Montana during previous years. A significant correlation was found between the time of feeding and air temperature but none between feeding period and relative humidity."

Reporting on his studies of parasites of the wheat joint worm (Harmolita tritici Fitch), F. F. Dicke, Charlottesville, Va., says: "A summary of the data on the abundance of joint worm parasites reveals that there has been a substantial increase in parasitism at all observation points with the exception of one point in eastern Virginia, * * * which showed a decrease in percentage of parasitism, the only point under observation which had an increase in joint worm abundance. The maximum percentage of parasitism (65 per cent) was found in Ohio. This point had a decrease of approximately 70 per cent in jointworm infestation, with an increase in percentage of parasitism of over 400 per cent. The rapid increase in parasitism at this point was largely due to Ditropinotus aureoviridis Crawf., a species which normally has three generations annually. It is apparent that the decrease in joint worm abundance greatly influenced the increase in percentage of parasitism. Two species, Eurytoma parva (Gir.) Phillips and Ditropinotus aureoviridis Crawf., predominated at all observation points in approximately equal numbers."

On the same subject T. R. Chamberlin, Forest Grove, Oreg., states: "A study of parasitism in 1931 stubble from near Tangent, Oreg., which lies in the 'Lebanon colony' of the joint worm, showed at the time of dissection the following condition:

Parasitism by D. aureoviridis (parasites present)	19.5	per cent
" " " " (including issuance)	29.3	" "
" " Eurytoma parva	17.8	" "
" " eupelmids (E. saltator Lind., etc.)	3.8	" "
Undetermined parasites	less than 1.0	" "
Total parasitism	51.2	" "

"In these dissections, as on some previous occasions, a record was kept of those Harmolita which were destroyed by Eurytoma which had entered more than one cell, and also of those Eurytoma which had been destroyed by other parasites. With these records included the actual destruction of Harmolita was shown to be 54.2 per cent and the original parasitism by Eurytoma 20.7 per cent."

D. J. Caffrey, of the European corn borer laboratory, Arlington, Mass., reports as follows on the recovery of parasites of the corn borer: "Credit should be given for North Central States data to W. A. Baker, of the Monroe, Mich., laboratory. * * * Masicera senilis Rond. is most outstanding in both two-generation and one-generation areas, having been collected from 37 towns in the former and 22 towns in the latter. It is becoming a decided factor of control in the East and is firmly established over a wide area in the North Central States, the vicinity of Jerusalem and Perkins, Ohio, and the Silver Creek, N. Y., sections especially. Inareolata punctoria Rom. is second in importance, having similar status to senilis in the Massachusetts area but not being as widely dispersed. In the one-generation area it is showing up best in the Silver Creek, N. Y., section, although recoveries have been made in Jerusalem, Ohio, and York, Ind. Eulimneria crassifemur Thoms., Phaeogenes nigridens Wesm., Zenillia roseanae Br. and Berg., and Z. mitis Meig. are of about equal status in the eastern section, with establishment certain, and in limited areas each is of increasing economic importance. None of this group have been recovered in the North Central States except crassifemur at Jerusalem and roseanae at Perkins, Ohio Microgaster tibialis Nees has been recovered from 4 towns in Massachusetts and from 13 towns in the North Central States, showing better establishment there."

COTTON INSECTS

G. A. Maloney, Tallulah, La., observed that boll weevils "continue to be more or less active in flight, owing to mild temperatures prevailing during the present winter, 52 weevils being taken from field screens on January 14 in Madison Parish, La. Live adults, larvae, and pupae were found in cotton bolls on January 16 in Madison Parish. Weevils were also found breeding in cotton blooms near Lucedale, Miss., during the last week in January."

G. L. Smith, J. C. Clark, and A. L. Scales report as follows on the result of flight screen studies: "It is noticed that the peak of weevil movement in December occurred between December 12 and 14, when the range of temperature was 78° to 80° F. maximum and 64° to 66° F. minimum. The peak of weevil movement in January occurred between January 14 and 18, and the range of temperature was 73° to 78° F. maximum and 56° to 66° minimum. Apparently a few days with a temperature around 70° is necessary to stimulate movement of the boll weevil during the hibernation period. * * * The cotton fields between the levee and river at Mound, La., which showed a weevil population of 1,614 per acre by the hoop and bag method on December 14, were surveyed on January 16, at which time the peak was reached in weevil collections on the flight screens and the following results were obtained: All green foliage was killed by frosts occurring early in January. Immature bolls on some plants were somewhat green and in these bolls live larvae and pupae were found. Several live adults were also found under bracts

on the outside of these green bolls. This indicated that our lowest temperature of 28° F. to that time was not low enough to kill the adult weevil in the field or stages in the bolls. The adult weevils found were very active."

K. P. Ewing, W. S. Cook, and R. L. McGarr, Tallulah, continuing population counts of the tarnished plant bug, report that "sweepings during January revealed that the adults of Lygus pratensis L. were still very active * * * No specimens of Adelphocoris rapidus Say or Psallus seriatus Reut. were collected.

Average per 100 sweeps of Lygus pratensis collected during January. (Approximately 300 sweeps per host were made each week.)

Host plant	1st week Jan. 4-9	2nd week Jan. 11-16	3rd week Jan. 18-23	4th week Jan. 25-30
Alfalfa	56.0	85.4	152.4	138.5
Aster ericoides	28.3	30.3	30.7	15.0
Golden rod	62.3	73.0	29.3	29.0

T. C. Barber, who has been making observations on the cotton leaf perforator (Bucculatrix thurberiella Busck) at Brownsville, Tex., says: "Breeding was continuous in the fields during January although very slow, and the specimens were very hard to find on account of their scarcity. During January we collected 5 living miners, 4 larvae in the web-molt stage, and 17 free larvae from the cotton plants, making a total of 26 specimens in the various larval stages. This proves that field development was in progress during the entire period." He states also: "From matings of reared moths made during November, 1931, we reared 3 moths which emerged during January, 1932. These moths had respective complete life-history periods, from date of mating of the parent moths to the date of emergence of the next-generation moths, of 43, 41, and 36 days--unexpectedly short life histories for the midwinter period. From a mating of reared moths made on December 24, 1931, two more moths were reared during January, 1932, with complete life-history periods of 34 days each."